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ATTACHMENT 24

Superfund Record of Decision:
Verona Well Field, MI
(Second Remedial Action, 08/12/85)
(EPA/ROD/R05-85/020)
August 1985

PB85-249514

Superfund Record of Decision (EPA Region 5)
Verona Well Field, Battle Creek
Calhoun County, Michigan
(Second Remedial Action), August 1985

(U.S.) Environmental Protection Agency
Washington, DC

12 Aug 85

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R05-85/020
August 1985

PB85-249514

EPA

Superfund Record of Decision:

Verona Well Field, MI
(Second Remedial Action, 08/12/85)

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA/RCD/R05-85/020	2.	3. RECIPIENT'S ACCESSION NO. PB85 249514/AS
4. TITLE AND SUBTITLE SUPERFUND RECORD OF DECISION Verona Well Field, MI		5. REPORT DATE August 12, 1985
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460		13. TYPE OF REPORT AND PERIOD COVERED Final ROD Report
		14. SPONSORING AGENCY CODE 800/00
15. SUPPLEMENTARY NOTES		

16. ABSTRACT

The Verona Well Field is located approximately 1/2 mile northeast of Battle Creek, Calhoun County, Michigan. The well field consists of three wells west of Battle Creek River and 27 wells, with a major pumping/water treatment station, east of the River. The Verona Well Field provides potable water to 35,000 residents of Battle Creek, and part or all of the water supply requirements for two major food processing industries and a variety of other commercial and industrial establishments. In 1981, county health officials discovered that water from the Verona Well Field was contaminated with volatile hydrocarbons. The Michigan Department of Natural Resources investigated potential sources of the contamination, and identified the Thomas Solvent Company facilities, the Grand Truck marshaling yard, and the Raymond Road Landfill as possible sources of the volatile hydrocarbons.

An IRM was signed in May 1984 that provided for the installation of interceptor wells and air stripping to prevent further deterioration of the well field. This second remedial action is a source control measure that includes construction of a ground water extraction well system to contain and collect contaminated ground water in the vicinity of the Thomas Solvent Company's Raymond Road facility. Contaminated ground water will be pumped to the existing Verona Well Field air stripper for treatment. In addition, air extraction wells will be installed to enhance the volatilization of the VOCs from the contaminated soils. The next operable unit will address source control

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Verona Well Field, MI Contaminated Media: gw, soil Key contaminants: VOCs, hydrocarbons, TCE, PCE, solvents, toluene		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report) None	21. NO. OF PAGES 46
	20. SECURITY CLASS (This page) None	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE at the Thomas Solvent Annex and the Grand Truck marshaling yard. Total capital cost for the selected remedial alternative is estimated to be $1,660,000 with O&M costs approximately $50,000 for the first two years of operation and $46,000 for each year thereafter.

RECORD OF DECISION
REMEDIAL ACTION SELECTION

Site Verona Well Field
Battle Creek, Calhoun County, Michigan

Documents Reviewed

This decision is based on the following documents describing the analysis of cost-effectiveness of remedial action alternatives for the source control operable unit at the Thomas Solvent Company Raymond Road facility.

- Phased Feasibility Study, Verona Well Field, Battle Creek, Michigan U.S. EPA, June 17, 1985

- Technical Memorandum, Phase II Water Quality Sampling, Verona Well Field, Battle Creek, Michigan, U.S. EPA, May 17, 1985

- Technical Memorandum, Phase II Drilling and Soil Sampling, Verona Well Field, Battle Creek, Michigan, U.S. EPA, May 17, 1985

- Summary of Remedial Alternative Selection

- Responsiveness Summary

- Memorandum from Steve Rothblatt, Chief, Air and Radiation Branch to Richard Bartelt, Chief, Emergency and Remedial Response Branch

- Memorandum from Robert B. Schaefer, Regional Counsel and Basil G. Constantelos, Director, Waste Management Division to Valdas V. Adamkus, Regional Administrator

- Letter from Richard A. Johns, Chief, Michigan Department of Natural Resources, Ground Water Quality Division to U.S. EPA

- Memorandum from Jack Kratzmeyer, Remedial Project Manager, Waste Management Division to File

Description of Selected Remedy

Construct a ground water extraction well system to contain and collect contaminated ground water in the vicinity of the Thomas Solvent Company's Raymond Road facility. Contaminated ground water will be pumped to the existing Verona Well Field air stripper for treatment. In conjunction with the pump and treat system, air extraction wells will be installed to enhance the volatilization of the VOCs from the contaminated soils.

Declarations

Consistent with the Comprehensive Environmental Response Compensation and Liability Act of 1980, and the National Contingency Plan (40 CFR Part 300), I have determined that installation of a ground water pumping system, and air extraction wells is a cost-effective remedial action and provides adequate protection of public health, welfare and the environment. The

State of Michigan has been consulted and agrees with the approved remedy. In addition, the action will require future operation and maintenance activities to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies for a period not to exceed 1 year.

I have determined that the action being taken is consistent with permanent remedy at the site, and is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

Additional feasibility studies at the Verona Well Field site will be completed in a series of operable units. If additional remedial action(s) are determined to be necessary, a Record of Decision will be prepared for approval of the future remedial action(s).

8/12/85.
Date

Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V

Executive Summary

This Record of Decision (ROD) describes the selection of the remedial alternative to address the environmental threats presented by the contamination located at the Raymond Road facility of the Thomas Solvent Company near Battle Creek, Michigan. Response activities at the Raymond Road facility represent a single operable unit in a complex situation involving two additional ground water plumes that comingle with the one originating at the Raymond Road facility.

The remedial alternative selected through this ROD addresses two discrete environmental problems at the Raymond Road facility: the contaminated ground water plume and soil contamination. As proposed in this ROD, the remedial alternative selected for the ground water is a pump and treatment system that would extract 400 gallons per minute of contaminated ground water which would be treated in a pre-existing air stripping facility and released to the Battle Creek River. It is anticipated that this pumping program will remove 68% of all the volatile contaminant mass contained in the ground water after 3 years operation. The cost of this system will be approximately $1,400,000.

The alternative selected to remedy the contaminated soils found on the Raymond Road facility is in-place treatment of these soils through enhanced volatilization. This alternative has had limited use in past applications and can be classified as "innovative technology". Enhanced volatilization essentially consists of the placement of several wells directly into the contaminated soils. They are then connected to a vacuum pump which draws air through the soils. The air is captured and treated to remove the volatiles. The estimated cost of this system is $413,000 and is expected to result in complete removal of the volatile contaminant mass from the soils in six months to a year.

Summary of Remedial Alternative Selection
Verona Well Field
Thomas Solvent Raymond Road
Operable Unit

Site Location and Description

The Verona Well Field is located approximately 1/2 mile northeast of Battle Creek, Calhoun County, Michigan (see Figure 1). The well field incorporates property on both sides of the Battle Creek River. The area north and east of the well field is essentially rural. Land use to the south and west is light to heavy industrial, with a residential area directly south, and the Grand Trunk Western Railroad (Grand Trunk) marshaling yard adjoining the well field on the east.

The well field consists of three wells west of the Battle Creek River (in Bailey Park), and 27 wells, with a major pumping/water treatment station, east of the river (see Figure 2 for well placement). The Marshall sandstone formation is the principal aquifer for the well field. Water transmission through the Marshall formation occurs primarily through fractures in the sandstone of the formation.

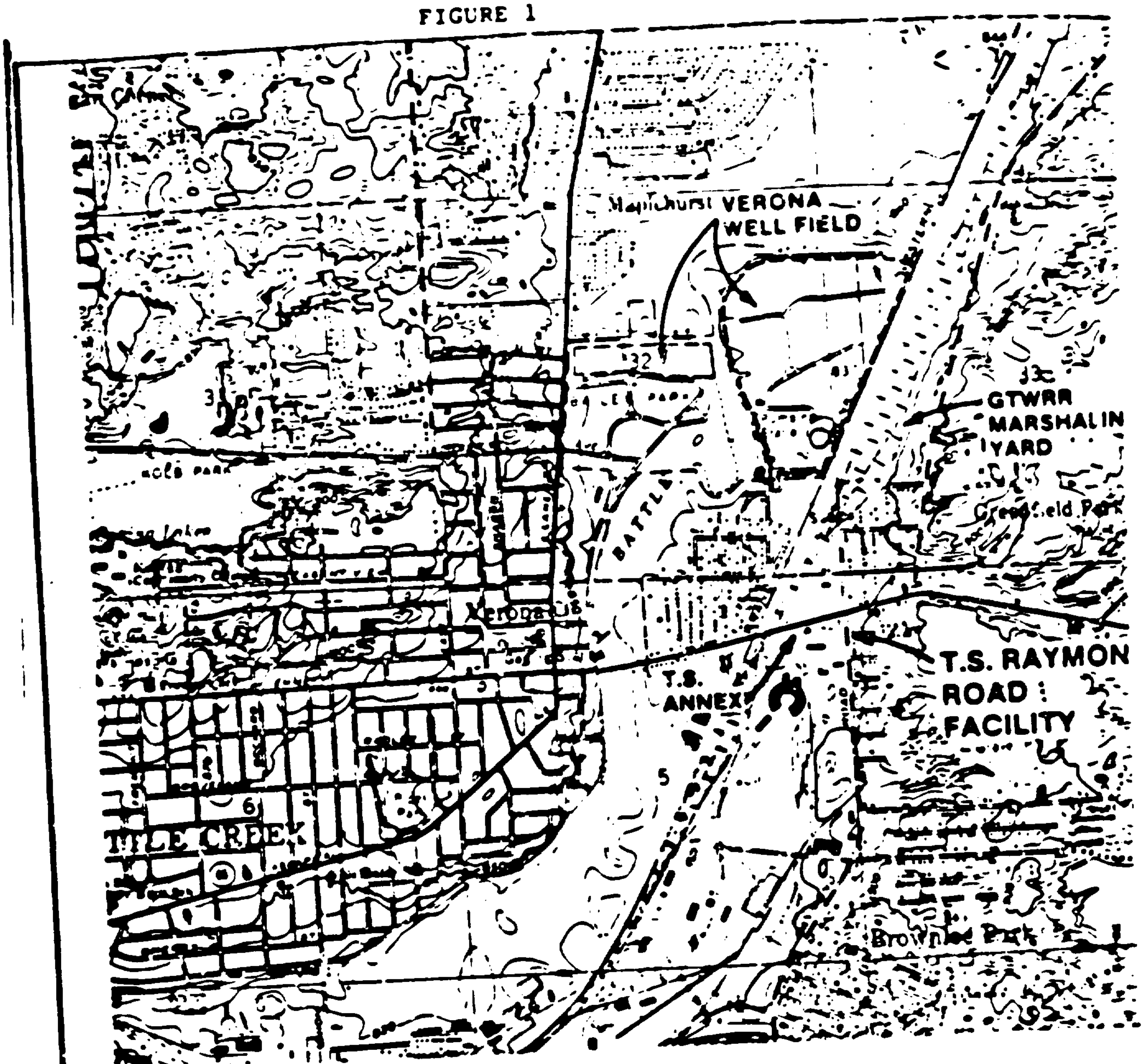
The Verona Well Field provides potable water to 35,000 residents of Battle Creek, and part or all of the water supply requirements for two major food processing industries and a variety of other commercial and industrial establishments. A review of the monthly pumping data for the last two years indicates that the City requires an average supply of water equal to approximately 10 MGD (million gallons/day) with additional supplies needed to meet a peak demand equalling 19 MGD.

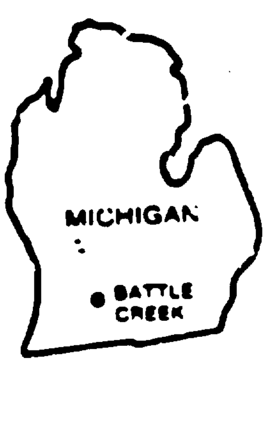
Site History

During August 1981, while conducting routine testing of private water supplies, the Calhoun County Health Department discovered that the water supply from the Verona Well Field was slightly contaminated with volatile organic compounds (VOCs). Followup testing by the Calhoun County Health Department and the Michigan Department of Public Health (MDPH) revealed that ten of the City's 30 wells contained detectable levels of volatile compounds. The MDPH then began weekly sampling of the well field.

During that same period, the MDPH began sampling private residential wells in the area to the south of the well field. To date, approximately 80 private wells have been found to contain varying concentrations of contaminants. Several of the private wells have total VOC contamination levels on the order of 1,000 ug/l (micrograms per liter, or parts per billion); the private well with the highest reported level had a dichloroethylene concentration of 3,900 ug/l. Because of the threat posed by the private well contamination, EPA implemented a bottled water program for the area residents, during the time a water supply system was being constructed to provide City water to the affected area. The system was completed in December 1983, and the EPA's bottled water program was discontinued.

FIGURE 1





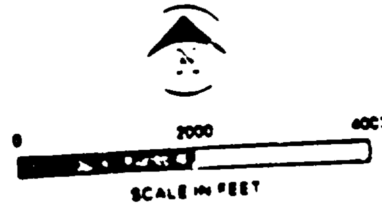


FIGURE 1
VICINITY MAP
THOMAS SOLVENT
RAYMOND ROAD FEASIBILITY S

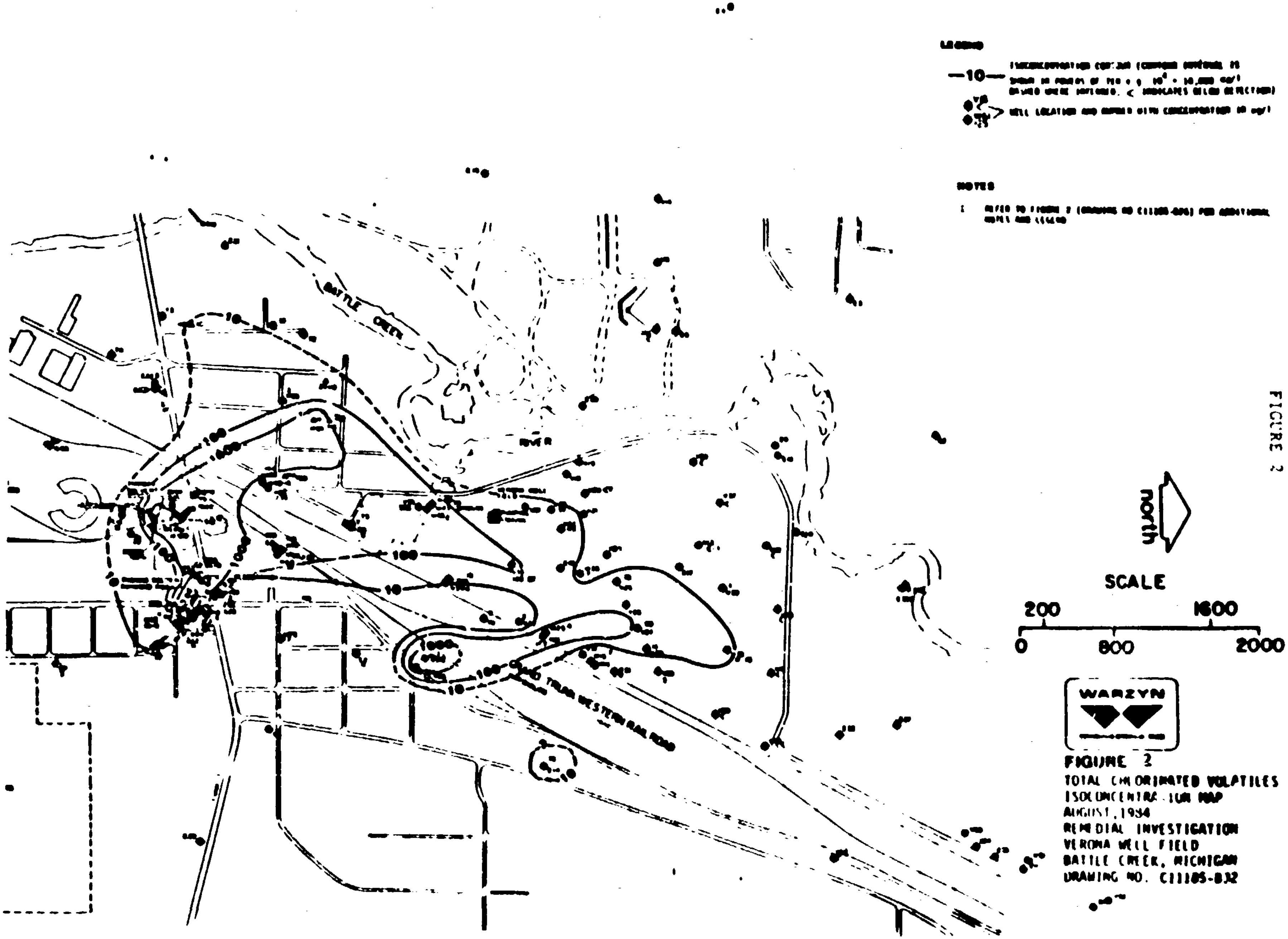


FIGURE 2
TOTAL CHLORINATED VOLATILES
ISOCONCENTRATION MAP
AUGUST, 1984
REMEDIAL INVESTIGATION
VERONA WELL FIELD
BATTLE CREEK, MICHIGAN
DRAWING NO. C11185-B32

FIGURE 2

The Verona Well Field was listed as a National Priorities List site in July 1982 (Group 4). Since then several studies, investigations and activities have been conducted in the area.

The Michigan Department of Natural Resources (MDNR) investigated potential sources of the contamination, and identified the Thomas Solvent Company facilities, the Grand Trunk marshaling yard, and the Raymond Road Landfill as possible sources of the volatile hydrocarbons. The EPA Technical Assistance Team (TAT) conducted a ground water survey during the spring of 1982, and further concluded that the source of contamination was most likely in the vicinity of the Thomas Solvent facilities. The U.S. Geological Survey (USGS) initiated a hydrological investigation under contract with the City of Battle Creek in 1982. The study examined the geology and ground water flow patterns in the vicinity of the Verona Well Field. The USGS has prepared a ground water flow model (1985) to evaluate the effects of pumping Verona wells on ground water flow. The U.S. Environmental Protection Agency (EPA) began Phase I of a remedial investigation (RI) in November 1983. The purpose of the RI was to identify the sources of contamination to the well field.

By January 1984, all but six of the City's 30 water supply wells in the Verona Well Field were contaminated with VOCs from the advancing ground water plume. Under these conditions, it was apparent that there would not be a sufficient supply of uncontaminated water to meet the City's peak demand in the summer of 1984. In response, EPA initiated a focused feasibility study (FFS) in February 1984 to address the water supply problem, while the remedial investigation on the sources of contamination proceeded.

The FFS resulted in a Record-of-Decision by Region V, EPA in May 1984 that recommended the installation of three new water supply production wells, and the use of selected existing Verona wells to form a blocking well system to halt the spread of contamination to the northernmost Verona wells. The purge water from the blocking wells would be treated by an air stripper to be constructed at the well field.

The blocking wells were started up immediately in May 1984, with temporary carbon adsorption beds providing treatment until the air stripper could be constructed. Construction of the air stripper was completed in August 1984. Since operation of the barrier wells began in May 1984, the advance of the contaminant plume further into the well field has been halted. The City currently can provide 22 MGD of uncontaminated water from existing and new wells. This amount is sufficient to meet the peak demand of 19 MGD. In its Record-of-Decision, EPA determined that the barrier system should be maintained for a period of five years. This means the City will have adequate supplies of uncontaminated water to meet established demand, until the time that final remedial measures are implemented.

The results of the Phase I remedial investigation were published in technical memorandum in November 1984. The results confirmed that the Thomas Solvent facilities were major sources of ground water contamination, and also, identified an unknown source of perchloroethylene (PCE) from a location east of the well field.

Phase II of EPA's remedial investigation was initiated in July 1984 to characterize in greater detail the extent of VOC contamination at the Thomas Solvent facilities, and to investigate the source of the eastern plume of PCE.

In February 1985, EPA determined that source control measures at the Verona Well Field site should be carried out in separate operable units. This decision was consistent with the National Contingency Plan (NCP) revisions proposed February 12, 1985, which state that operable units can and should begin before selection of a final remedial action, if they are cost-effective and consistent with a permanent remedy [40 CFR 300.68(d)(3)].

Source control at the Thomas Raymond Road facility was identified as the first operable unit that should be conducted at the Verona Well Field site. This operable unit was selected first because of the relative magnitude of contaminaton at the Raymond Road facility.

The ground water beneath and surrounding the Thomas Raymond Road facility is contaminated at levels exceeding 100,000 ppb VOCs. This is approximately 100 times more concentrated than levels in the majority of the plume. A separate organic phase liquid has also been observed at one location on the Thomas Raymond Road property.

The Thomas Solvent Company operations at the Raymond Road facility consisted of the packaging and distribution of liquid solvent commercial products, as opposed to liquid wastes, with the exception of minor amounts of reclaimed acetone. Consequently, as the owner/operator Thomas Solvents is considered the only potentially responsible party for the contamination at the Raymond Road facility. The generators of the reclaimed acetone hauled by Thomas are unknown, and since this activity represented a minor portion of Thomas Solvent business (less than 5%), enforcement efforts have been directed at Thomas as owner/operator.

On April 6, 1984, Thomas Solvent Company filed a voluntary petition under Chapter 11 of the Bankruptcy Code in the Bankruptcy Court for the Western District of Michigan. That proceeding is still pending, but holds little possibility for any substantial recovery of funds or for any significant contribution to any settlement of this matter. In the bankruptcy action there are four primary claimants: U.S. EPA, the State of Michigan, and two separate groups of local residents who are claiming various injuries. In the aggregate, the claims against the estate of the bankrupt amount to well over $100,000,000.00, and the assets that have been included in the estate amount to less than $400,000.00 The bankrupt has ceased all operations at the Raymond Road facility, and apart from the possibility of a small monetary recovery, it is almost certain that Thomas Solvent Company will make no significant contribution to any settlement of this matter.

Current Site Status

The Thomas Raymond Road facility consists of an office, garage, warehouse, loading docks, and 21 underground storage tanks. Figure 3 shows the location of tanks, buildings and property boundaries. The facility was used for the storage, transfer and packaging of chlorinated and nonchlorinated solvents.

Ground water monitoring wells and borings were installed during the site investigations at the locations shown in Figure 4. Measurements of the levels of soil and water contamination are available for these well locations. In the discussion that follows, well locations will refer to the wells designated on Figure 4.

Besides the underground tanks, solvents were handled on the site at four main locations. These locations are listed below:

- Within the tank truck loading/unloading area. Well B-14 was installed in this area.
- Within the warehouse where drums were filled using the feed lines from each of the underground tanks.
- At the south dock where filled drums were stored for loading onto semi-trailers. Borings B-11 and B-12 were located near the loading areas.
- At the east dock where drums were occasionally stacked.

As shown in Figure 3, the chlorinated solvent tanks (tanks 6, 7 and 8) are located north of the warehouse in the vicinity of Well B-17. Trichloroethylene, PCE, and 1,1,1-TCA were stored in these tanks. These compounds and their "breakdown products" have been found in the Verona Well Field.

The aquifer in the area of the Verona Well Field consists of two units: a shallow sand and gravel deposit overlying the sandstone bedrock of the Marshall Formation. The Verona Well Field is developed in the bedrock. Based on hydraulic conductivity tests of the sand and the bedrock, there does not appear to be a significant conductivity barrier between the two units. Therefore, the two units are considered to be in direct hydraulic connection, and contaminants are free to pass from one unit to the other. The contaminants have migrated from the sand and gravel at the Thomas Raymond Road facility into the bedrock within the well field. At the Thomas Raymond Road property, the sand and gravel deposits vary from 13 feet to a maximum of 45 feet at Well B-18. The ground water is estimated to flow at 1-2 ft./day across the property to the northwest.

During the RI soil samples from the unsaturated zone were obtained from borings B-11 through B-18. The vertical distribution of total VOCs is shown in Figure 5. The cross-section on Figure 5 encircles the warehouse and dock area where solvents were mainly handled on the property (see the lower right corner of Figure 5 for detail). The unsaturated zone soil contamination at Well B-14 is relatively uniform throughout the depth of the unsaturated zone. The same is true for contamination at Boring B-13, and in general at Borings B-12, B-15, and B-16.

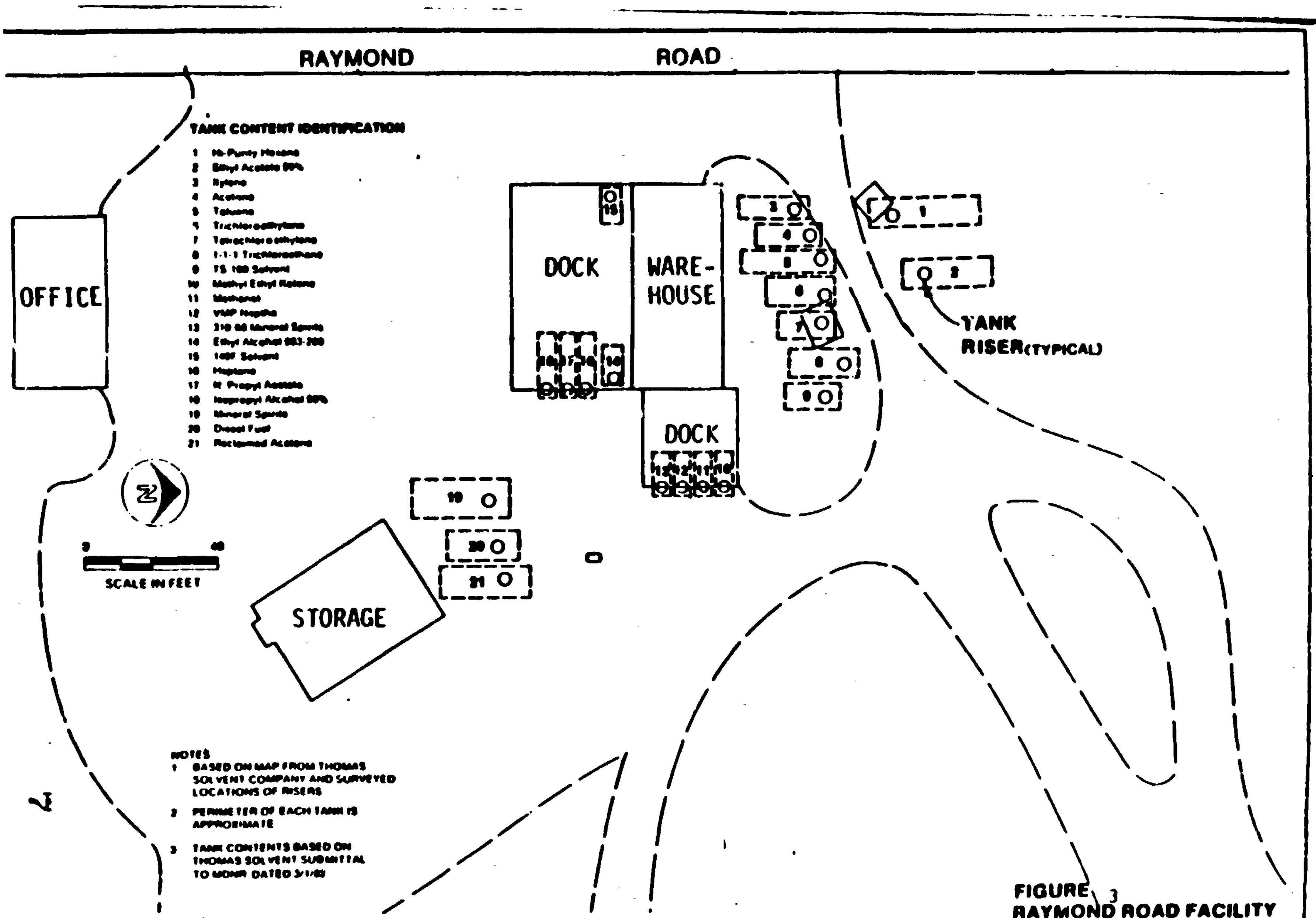
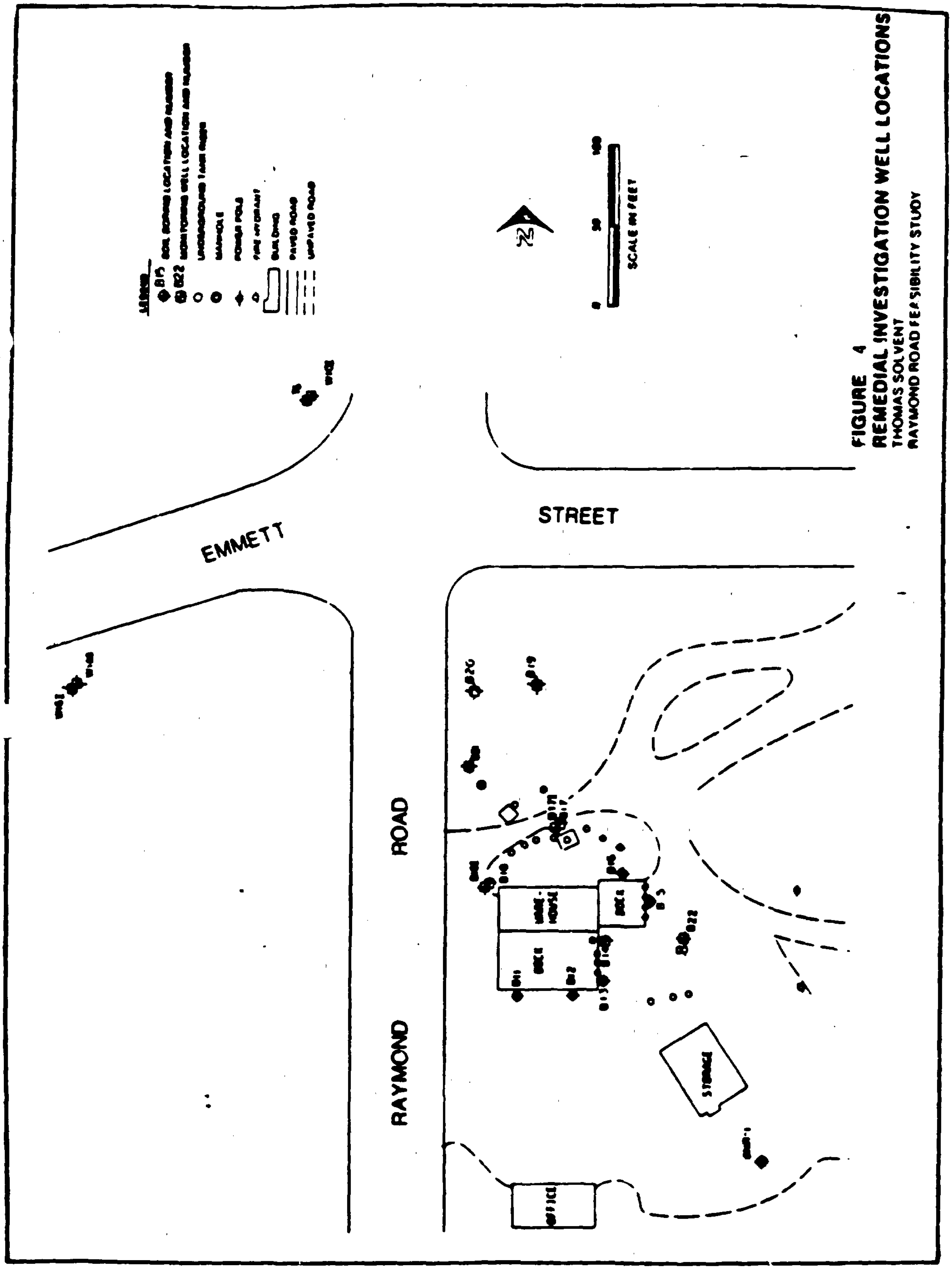


FIGURE 3
RAYMOND ROAD FACILITY
SITE MAP
THOMAS SOLVENT

FIGURE 3

FIGURE 4


EMMETT
STREET
RAYMOND
ROAD
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OFFICE
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FIGURE 4
REMEDIAL INVESTIGATION WELL LOCATIONS
THOMAS SOLVENT
RAYMOND ROAD FEASIBILITY STUDY

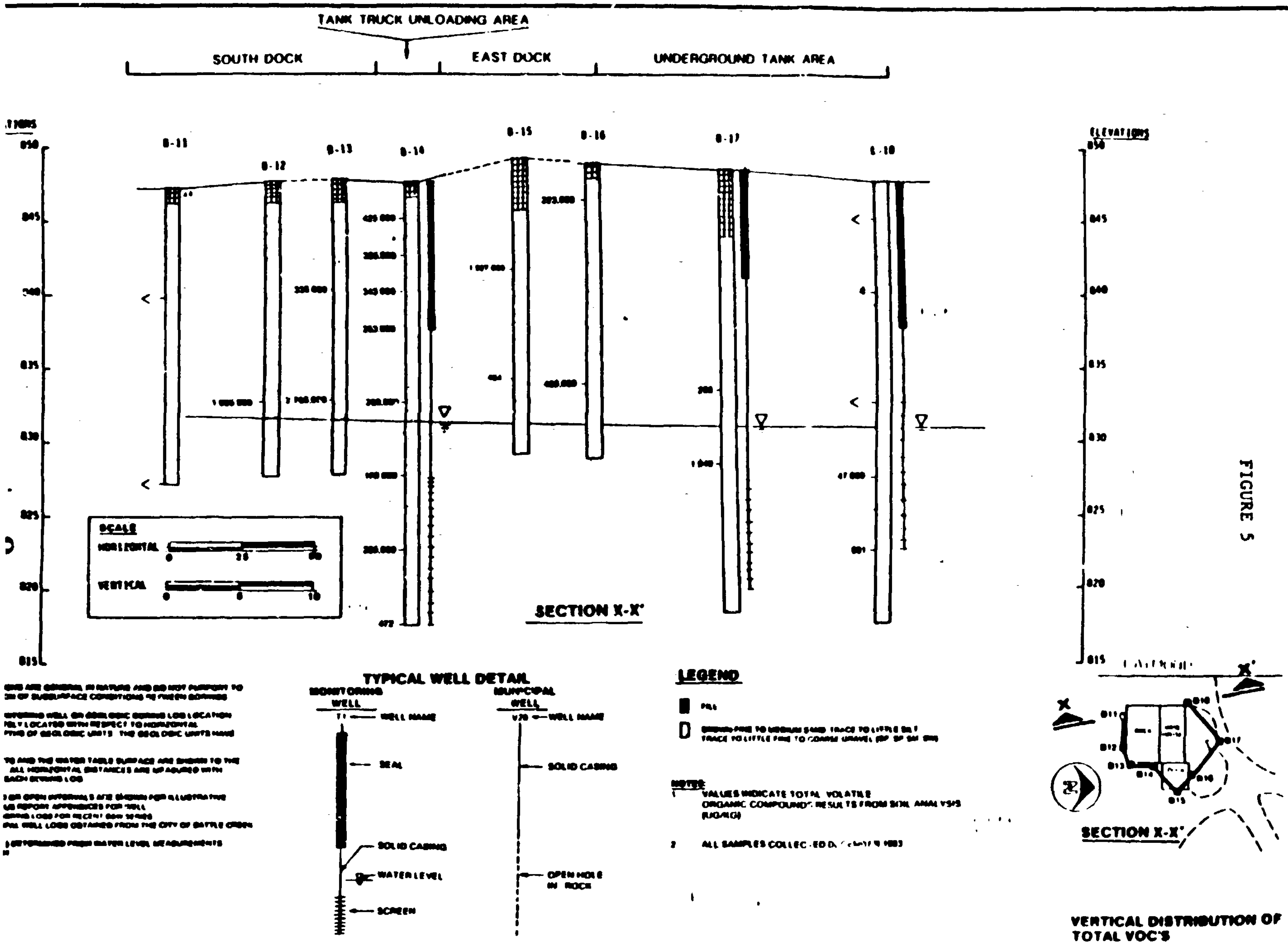


FIGURE 5

VERTICAL DISTRIBUTION OF TOTAL VOC'S
THOMAS SOLVENT
RAYMOND ROAD FEASIBILITY STUDY

This type of contaminant distribution would be likely to result from spillage during surface handling of solvents on and around the dock area. The soil contamination is much less at borings B-17 and B-18 which are in the underground tank area, where solvents were not handled at the surface. In this area, leakage from the tanks would be expected to move directly to the ground water.

Each of the 21 underground tanks were tested for leaks in March 1984 by the Thomas Solvent Company. As part of the leak testing each tank was filled with mineral spirits after the tanks had been emptied as specified in the Preliminary Injunction against Thomas Solvent issued on February 23, 1984, by the Calhoun County Circuit Court. Nine of the 21 tanks had a measurable loss rate (>0.05 gallons/hr). The test results are given in Table 1.

Table 1

UNDERGROUND TANK LEAKAGE RATES

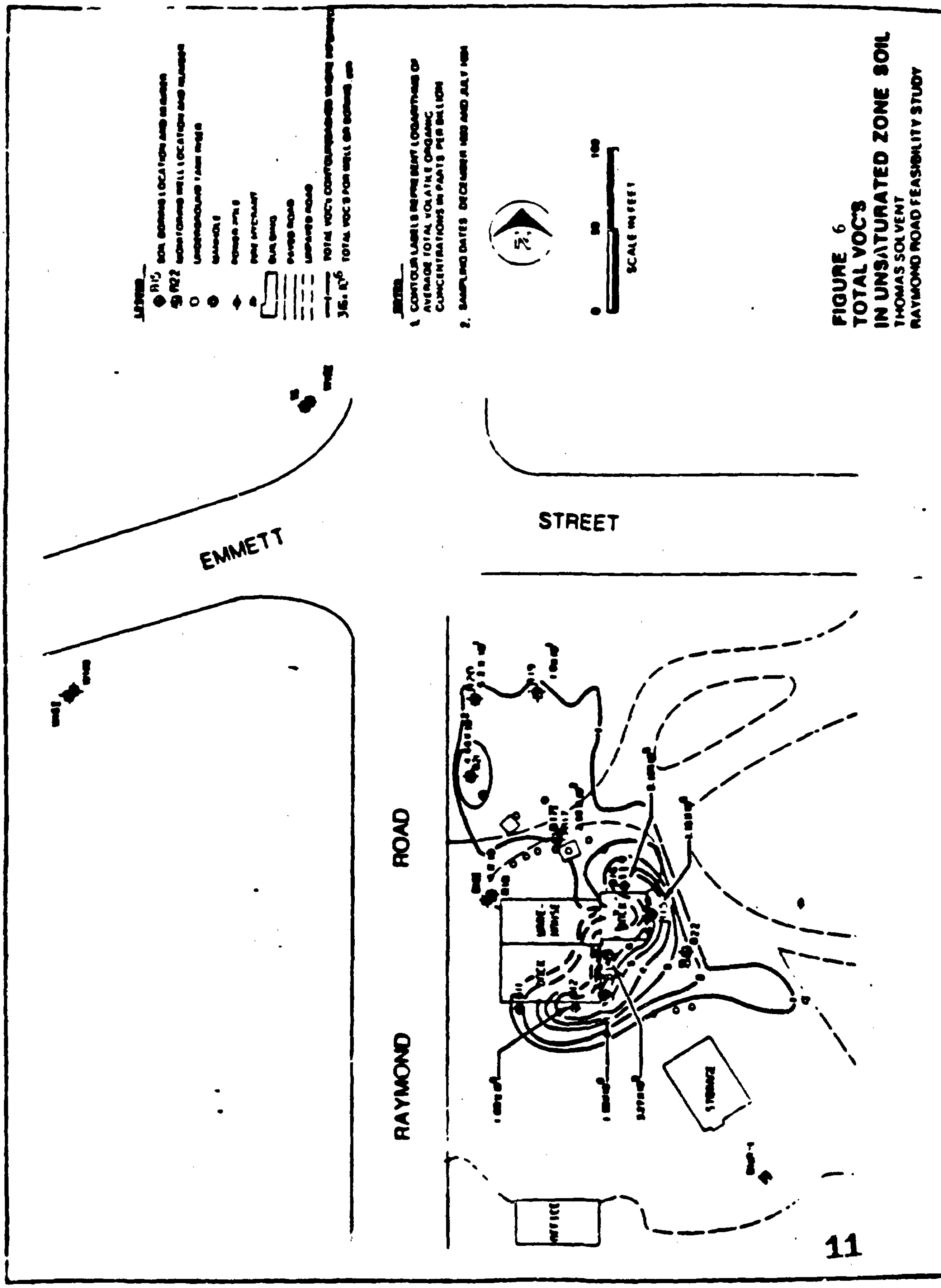
Tank Number	Contents[a]	Leakage Rate (gal/hr)
1	Hexane	0.556
2	Ethyl acetate	0.179
5	Toluene	0.073
6	Trichlorethylene	0.067
8	1,1,1 Trichlorethane	0.232
11	Methanol	0.069
16	Active Thinner	0.066
18	#300 Mineral Spirits	0.086
20	Diesel Fuel	0.181

[a]Reflects tank contents at time of testing. May not agree with contents shown on Figure 3.

A contour map of the concentration of total VOCs in the unsaturated zone soils is shown in Figure 6. The total mass of VOCs within the 10-ppb contour line is approximately 1700 pounds. The total mass of VOCs outside of that contour is only one pound. Consequently, the overwhelming majority of the total VOCs in the unsaturated zone (1699 of 1700 pounds) is located in a relatively confined area defined by the 10-ppb contour line.

A map of the total VOC concentration in the ground water in the vicinity of the Thomas Raymond Road facility is shown in Figure 7. The highest observed ground water concentration has been at Well B-18, which then follows ground water flow to the northwest towards Well W-16. The peak in ground water concentration (at Well B-18) does not coincide with the peak in the unsaturated zone soil contamination, which was between borings B-13 and B-15. This is because of the different sources of contamination in the area. Contamination between B-13 and B-15 is from solvents spilled at the surface, which have then migrated through the unsaturated zone to the water table. The source of contamination to the ground water at Well B-18 is from leakage from the underground tanks, and also migration from the upgradient sources, such as B-14.

FIGURE 6



EMMETT
STREET
RAYMOND
ROAD
STORAGE
SCALE IN FEET
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FIGURE 6
TOTAL VOC'S
IN UNSATURATED ZONE SOIL
THOMAS SOLVENT
RAYMOND ROAD FEASIBILITY STUDY

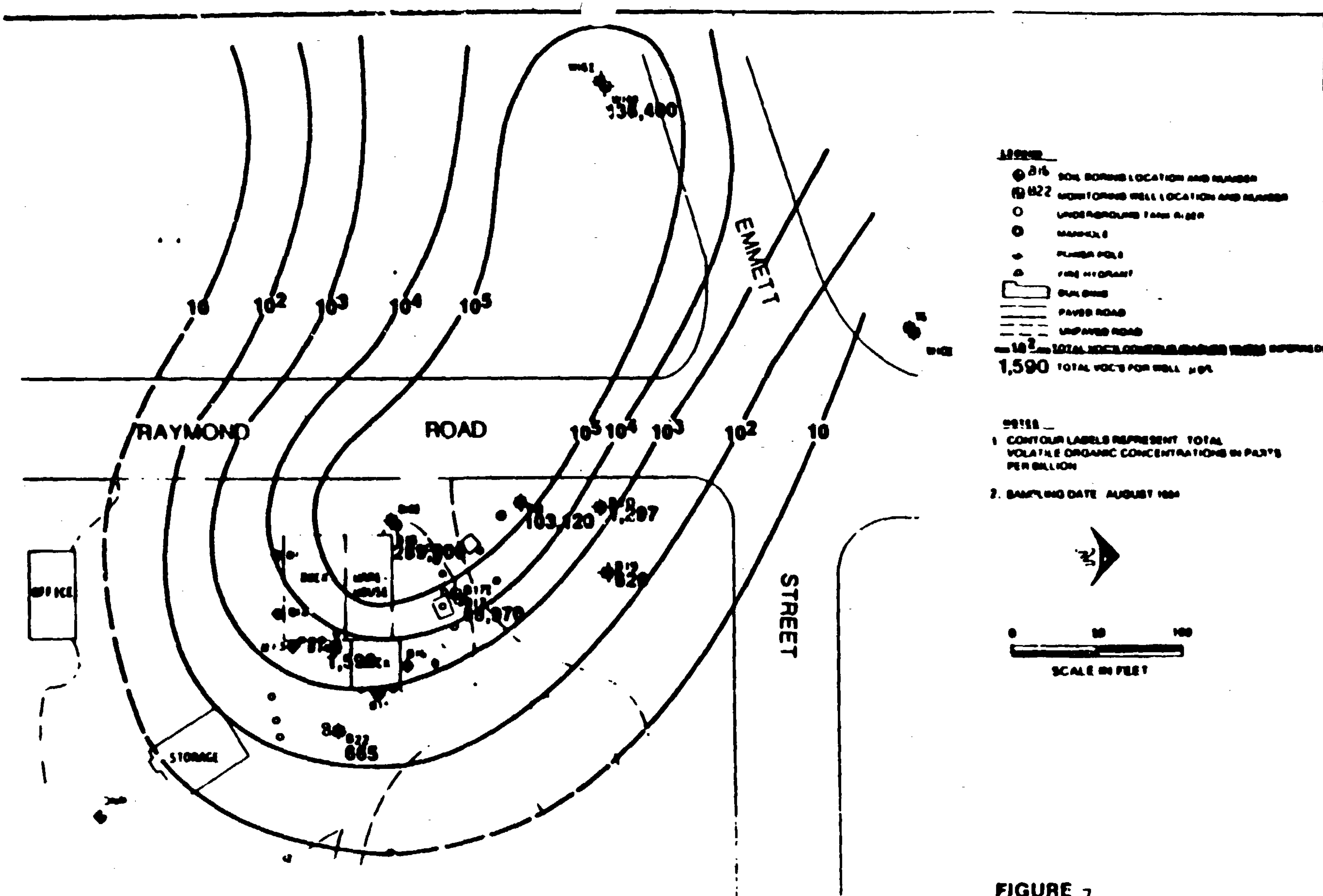


FIGURE 7
TOTAL VOC'S
IN GROUNDWATER
THOMAS SOLVENT
RAYMOND ROAD FEASIBILITY STUDY

FIGURE 7

The vertical extent of ground water contamination is shown by the concentration contours for 1,2-DCE in Figure 8. The highest concentration is within the sand and gravel at B-18. Downgradient of well W-16, the plume drops into the bedrock, and the concentration in the sand and gravel unit decreases.

The estimated mass of contaminants in the ground water is given in Table 2.

Table 2
Mass of VOCs in Ground Water

Southern Plume (Saturated Zone)	5,700 lbs.
Raymond Road Facility Property (Saturated Zone)	440 lbs.
Raymond Road Facility Vicinity (Saturated Zone)	3,900 lbs.

A separate organic-phase liquid has also been observed at Well B-18. This organic phase consists of up to 10-20 percent chlorinated solvents. Accumulation of this organic phase has been limited primarily to B-18, which has been pumped several times to recover the solvent layer. The source of the organic-phase liquid appears to be a highly concentrated suspension in the upper portion of the saturated zone.

The compounds that have been detected at the Thomas Raymond Road facility during the site investigations are listed below.

Table 3

Chlorinated Hydrocarbons

Methylene chloride
Chloroform
Carbon tetrachloride
1,2-Dichloroethane (1,2-D[illegible])
1,1,1-Trichloroethane (1,1,1-TCA)
Vinyl chloride
1,1-Dichloroethylene (1,1-DCE)
trans-1,2-Dichloroethylene (t-1,2-DCE)
Trichloroethylene (TCE)
Tetrachloroethylene, commonly called perchloroethylene (PCE)

Aromatics

Benzene
Toluene
Xylene
Ethyl Benzene
Napthalene

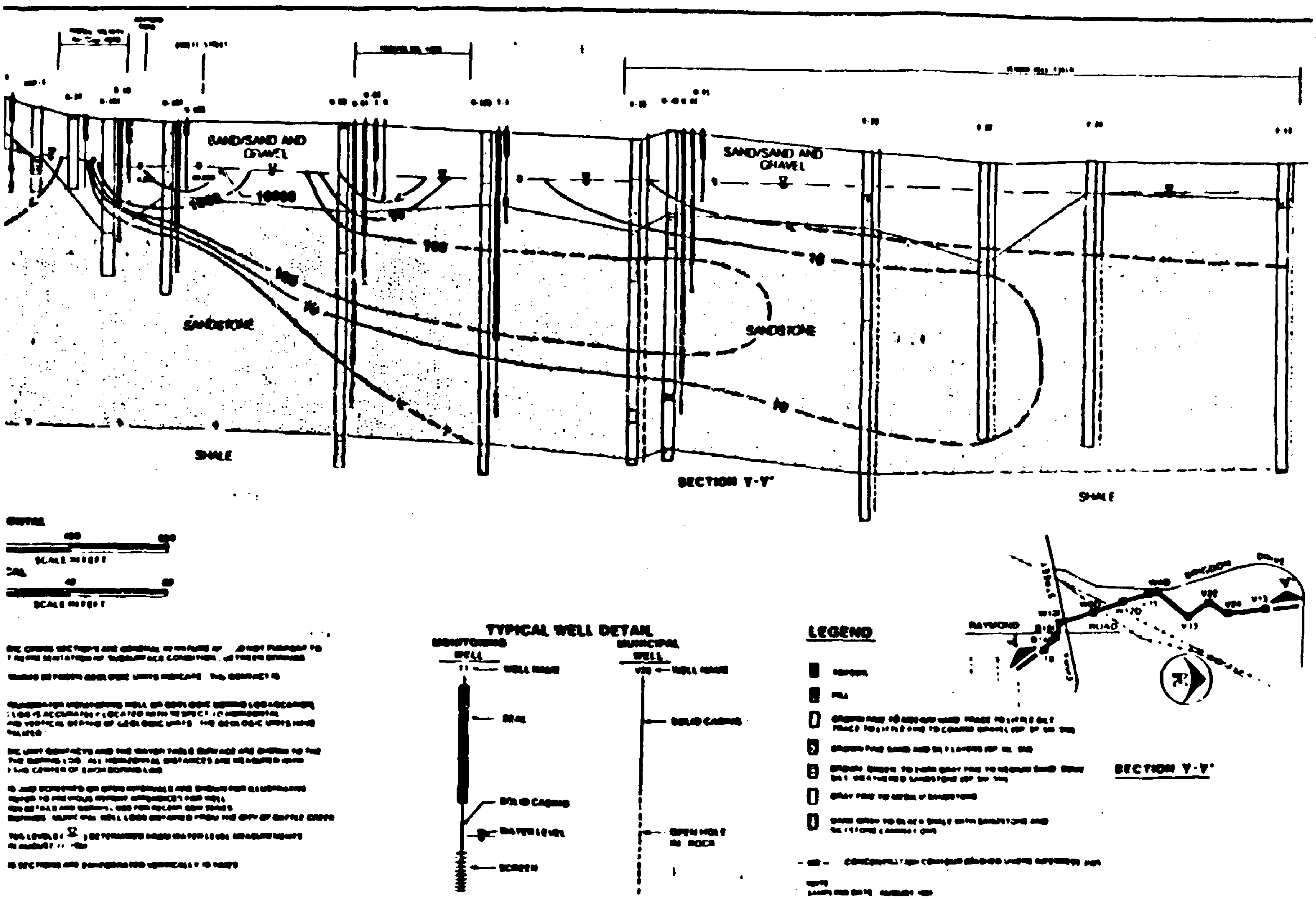


FIGURE 8: VERTICAL DISTRIBUTION OF 1,2-DICHLOROETHYLENE IN GROUNDWATER

Ketones

Acetone
Methyl ethyl ketone (MEK)
Methyl isobutyl ketone (MIBK)

Of the contaminants found at the site, the chlorinated hydrocarbons are the most environmentally significant. They are very motile, and are slow to degrade when they are in soil or ground water. This accounts for the wide extent of the chlorinated hydrocarbon plume. Several of the chlorinated hydrocarbons are known or suspected carcinogens.

Like the chlorinated hydrocarbons the aromatic compounds are mobile, but they are more biodegradable. Consequently, there has been limited migration of aromatics from the site because the compounds are degraded as they migrate from the source. Benzene is the only aromatic that is known to be a carcinogen.

The ketones are very mobile, but they also biodegrade rapidly and are relatively non-toxic.

Enforcement

Current State and Federal enforcement activities are focused on two identified potentially responsible parties (PRP's): Thomas Solvent Company and Grand Trunk Rail Road. Both PRP's declined to conduct the RI/FS in April 1983, and both declined, in April 1984, to undertake the immediate removal action at the Verona Well Field (installation of a temporary purge system). Specific administrative actions to force PRPs to perform the initial remedial measures were not taken because the nature of the problem at the well field dictated that EPA act quickly.

In February 1984, Thomas Solvent Company was ordered by EPA through a unilateral section 106 CERCLA Administrative Order to purge a separate organic phase liquid from ground water beneath the Company's main facility at Raymond Road. Thomas complied with the Order and purged 500 gallons of contaminated water.

The layer of contamination was not wide spread, but periodic purging is required, and was continued by Thomas until March, 1985. The buildup of this organic phase liquid (greater than 1.0 foot) has been limited to a single well (B-18) on the property except for one observation in February 1985, when about 3 feet was observed in a monitoring well located approximately 20 feet west (direction of Verona Well Field) of Well B-18. It was this observation, in part, that has caused initial State and Federal source control actions to focus on the Thomas Solvent Raymond Road facility.

In January 1984, the Michigan Attorney General filed a civil complaint in State court for injunctive relief against Thomas to clean up soil and ground water contamination at both Thomas facilities upgradient of Verona Well Field. An order has been entered in that proceeding in favor of the State, and Thomas subsequently filed a Chapter 11 petition under the Bankruptcy Code placing the Company's viability as a responsible party in question.

EPA has filed a claim in the continuing bankruptcy proceeding for costs incurred for remedial action at the Verona Well Field.

Grand Trunk is the landowner of the Thomas Annex, and owner/operator of a marshaling yard east of the well field. Data obtained during the remedial investigation has positively identified one area within the marshaling yard as a source of contaminants that are migrating to the Verona Well Field. Two other areas within the marshaling yard were tentatively identified as potential sources of contaminants to the well field, but monitoring wells have not yet been installed to verify these areas as sources.

EPA has prepared a work plan for additional remedial investigation activities that the Agency believes are necessary to fully identify and characterize the sources of contamination which exist at the marshaling yard. Discussions will be initiated with Grand Trunk to determine its interest in performing the investigations outlined in the work plan.

Alternatives Evaluation

During the initial stage of this phased feasibility study (PFS), potential remedial technologies were screened according to the following factors: 1) suitability for site conditions and contaminant characteristics; 2) effectiveness of achievable cleanup or control; 3) level of demonstrated performance under similar conditions; and 4) relative cost.

The purpose of technology screening was to assemble potential remedial action alternatives that would meet the objectives of this operable unit, namely:

- To remove, contain, or destroy contaminants in the unsaturated-zone soils on the Thomas Raymond Road property, and
- To remove contaminants from, and minimize continued migration of contaminants from the highly contaminated ground water surrounding the site.

After the screening, six alternatives were judged to meet the objectives of the project and were evaluated further:

ALTERNATIVE #1 - Install an extraction well system at the Thomas Raymond Road site. Pump the contaminated ground water via a transfer pipe to the existing Verona Well Field air stripper. Discharge the treated water to the Battle Creek River.

ALTERNATIVE #2 - Install a clay cap over the contaminated soil area.

ALTERNATIVE #3 - Install a system of air extraction wells in the unsaturated zone to induce a flow of air through the soil in-situ to remove the VOCs.

ALTERNATIVE #4 - Install a piping system and berm configuration to allow flooding of the contaminated soil area with uncontaminated water. The clean water would infiltrate into and percolate through the contaminated soil. The VOCs are washed from the soils into the ground water which is captured by the pumping system.

ALTERNATIVE #5 - Excavate contaminated soils and dispose in an onsite disposal facility.

ALTERNATIVE #6 - Excavate contaminated soils and transport to an offsite facility for disposal.

Ground water pumping and treatment as described in Alternative 1 is the only contaminated ground water option that was retained for detailed alternatives evaluation. The reason for this is that the site geology precludes the use of passive physical vertical barriers since the only available natural confining unit is a shale formation located at a depth of 140 feet. A natural confining unit is needed to key the barrier into, at a depth accessible by trenching equipment. The shale formation is too deep for the trench excavation and backfilling necessary for installation of a vertical barrier.

Each of the remaining five remedial action alternatives considered includes the ground water pumping and treatment actions contained in Alternative 1; the remaining alternatives differ primarily in their approach to the contaminated soils at the site.

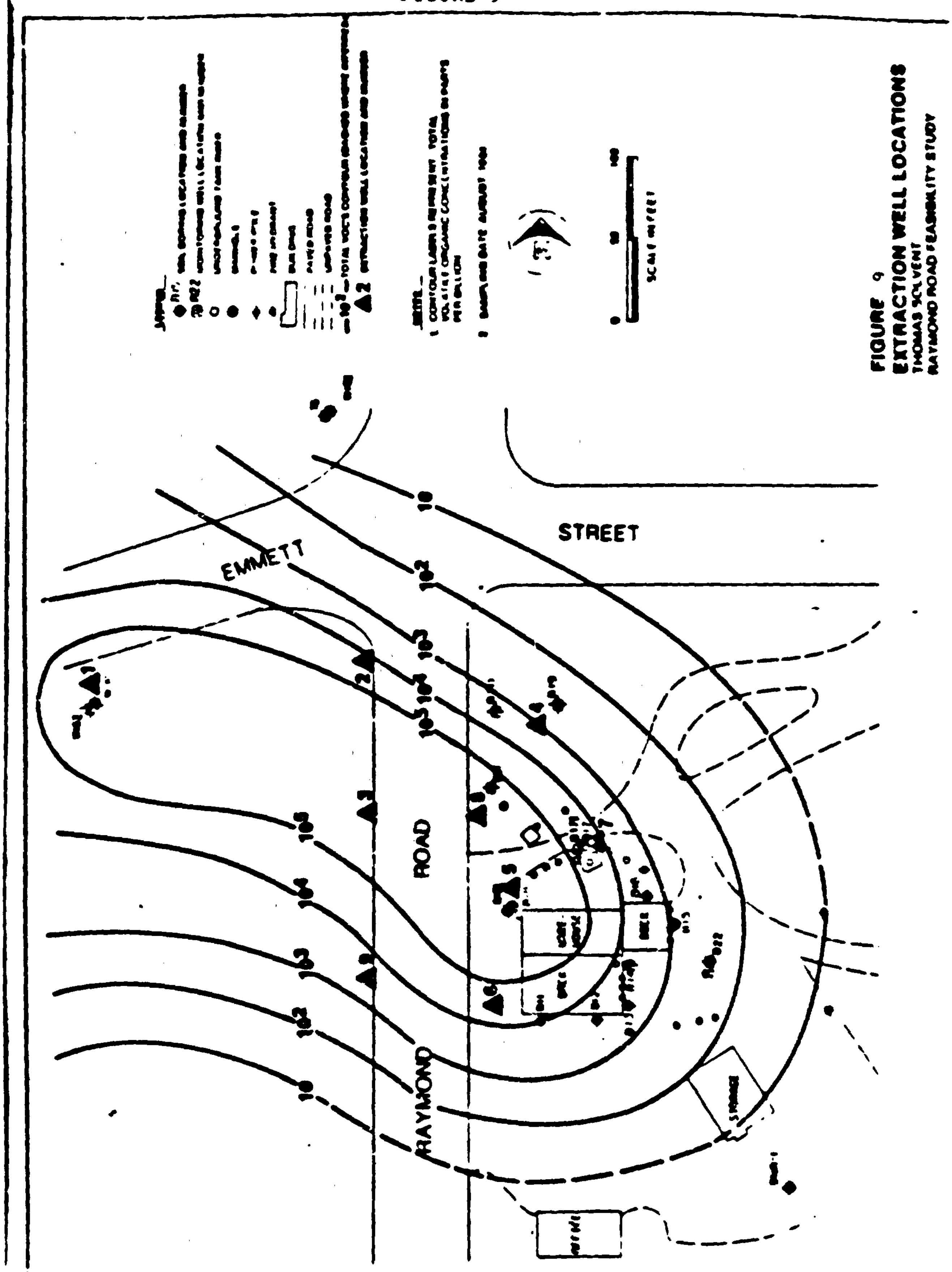
Alternative 1:

Alternative 1 is designed to pump contaminated ground water from the Thomas Raymond Road site vicinity to the existing air stripper at the Verona Well Field. The site vicinity, as defined in the section on Current Site Status, includes the area defined by the 1×10^5 ppb total VOCs concentration contour shown on Figure 9. Extending the ground water pumping system beyond the site boundaries to include this area provides the following benefits:

- About 68 percent of the contaminant mass (3900 of 5700 total pounds, see p. 6 above) in the southern plume is contained within this area, while only 8 percent of the contaminant mass is in the ground water directly beneath the Raymond Road facility property.
- The ground water plume in this area is contained in the sand and gravel unit of the aquifer rather than the bedrock. Soil conditions in this unit allow removal of contaminants at a moderate pumping rate. Downgradient of this area, the plume migrates into the sandstone bedrock, which has less favorable pumping characteristics.

A number of pumping schemes were analyzed during the PFS, and it was determined that a total pumping rate of 400 gpm would produce the radius of influence necessary to contain and collect the highly contaminated ground water in the

FIGURE 9


EMMETT
STREET
RAYMOND
ROAD
STORAGE
SCALE IN FEET
FIGURE 9
EXTRACTION WELL LOCATIONS
THOMAS SOLVENT
RAYMOND ROAD FEASIBILITY STUDY

vicinity of the site. An evaluation of higher pumping rates indicated that cleanup time would not be reduced, because higher pumping rates would cause upward flow of uncontaminated water from the sandstone aquifer. This would serve only to dilute the contaminated ground water and increase the volume of water that must be pumped to remove the mass of contaminants.

A pumping rate of 400 gpm allows the use of the existing air stripper at the Verona Well Field for water treatment, since that system has sufficient unused treatment capacity to accomodate an additional 400 gpm. The option of installing a new 400 gpm air stripper at the Thomas Raymond Road site was considered, but was dropped when preliminary cost information indicated that costs for a new stripper greatly exceeded the cost of a transfer pipe to the existing air stripper at the Verona Well Field.

During approximately the first four weeks of operation of the ground water extraction system, the concentration of VOCs in the ground water pumped from the Thomas Raymond Road site are expected to exceed levels appropriate for river discharge, even after treatment in the air stripper. To provide additional treatment during this initial high concentration period, a temporary granular activated carbon system will be installed upstream of the air stripper to reduce contaminant levels prior to stripping.

Several different treatment methods are possible for treating ground water-contaminated with volatile organic compounds. These include chemical oxidation, biological degradation, stipping with air and/or steam, and granular activated carbon adsorption. In most cases where contamination is limited to VOCs the selection narrows quickly to air stripping or granular activated carbon adsorption. The other methods have been shown to be either ineffective or too costly for use in this application. Since the optimum ground water extraction rate of 400 gpm can be handled at the existing stripper, no capital costs for treatment are incurred, which offers a clear cost advantage over carbon adsorption as a stand-alone technology.

For this alternative, minimal action would be taken in response to the unsaturated zone soil contamination. Natural leaching from rainwater infiltration, and volatilization to the atmosphere will reduce VOC concentrations in the unsaturated zone soils.

Table 4

Cost for Alternative # 1
Ground Water Pumping

Capital Cost	$1,248,000
Annual O & M	$ 90,000
Present Worth (3 years)	$1,404,000

The annual operation and maintenance costs include the estimated costs for replacement, as needed, of the vapor phase carbon in the emission control system used with the existing air stripper.

Air stripping is designed to remove VOCs from water by transferring the contaminant mass from the water to an air stream, and therefore use of this treatment method will result in a VOC air emission. A vapor phase carbon adsorption (i.e., Best Available Control Technology) system was installed as part of the IRM, to treat and control the VOC emissions from the air stripping of the purge water from the blocking well system. Region V's Air Management Division staff has modeled the additional emissions resulting from treatment of Thomas Raymond Road ground water at the existing air stripper. The present air stripper emissions were used as baseline conditions, and additive cancer risks as specified below were calculated for a number of operating periods for the Thomas Raymond Road extraction well system.

	Additional Peak Cancer Risk
Existing Verona Well Field Air Stripper	1.1×10^{-7} Baseline
*Raymond Road ground water, Day 1	2.7×10^{-7}
*Raymond Road ground water, 1st Month	3.1×10^{-8}
Raymond Road ground water after 1st Month	2.6×10^{-7}

*During the initial four weeks of operation, in addition to vapor-phase carbon adsorption a water-phase carbon adsorption system will be located upstream of the air stripper.

The results of the modeling indicate that with continued use of vapor phase carbon adsorption control, the excess cancer risk due to VOC emissions does not exceed 1×10^{-6}.

Extraction well #5 (see Figure 9) would be located in the area around Well B-18, where the separate organic-phase liquid has been observed. An organic-phase recovery well would be installed adjacent to the extraction well to capture any organic liquid floating on the water table.

ALTERNATIVE 2:

Alternative 2 consists of the installation of a clay surface cap over the area of contaminated soils to reduce infiltration into the contaminated soil in the unsaturated zone. The ground water pumping and treatment scheme for this alternative is the same as that described for Alternative 1.

The cap would be designed to reduce infiltration through the unsaturated zone by at least 90 percent, allowing approximately 1 inch per year of percolation. The effectiveness of a cap is a function of its ability to isolate the contaminant mass in the unsaturated zone soils from rainfall infiltration, thereby reducing the mass of VOCs that is leached into the ground water. The cap would also restrict the release of VOCs to the atmosphere.

Table 5

Cost for Alternative # 2
Surface Cap

Capital Cost	$291,000
Annual O & M	$ 19,000
Present Worth (3 years)	$324,000

The rate at which contaminants are released to the ground water has an effect on the rate of ground water cleanup. Since the cap would drastically restrict leaching out of the unsaturated zone immediately, the reduction of contaminant mass in the ground water would be relatively rapid. The mass of VOCs in the ground water would decrease to less than 100 lbs. in about one year. After 3 years the ground water concentration would level off at approximately 100 ppb.

However, a critical fact in the capping alternative is that the mass of contaminants remaining in the unsaturated zone after three years would be virtually the entire 1700 lbs. of VOCs. In other words, capping does nothing to actually treat the soil contaminants.

ALTERNATIVE 3:

Alternative 3 is designed to reduce the mass of contaminants in the unsaturated zone by inducing a flow of air through the soil to volatilize the contaminants. Once volatilized the VOCs would be removed from the air stream by vapor phase activated carbon.

An array of overlapping air extraction wells, installed in the unsaturated zone, would be connected by an airtight transfer line to a vacuum pump.

Table 6

Cost for Alternative # 3
Enhanced Volatilization

Capital Cost	$413,000
Annual O & M *	0
Present Worth (3 years)	$413,000

*Cost estimate is based on contractor start-up and operation of enhanced volatilization system. Estimate of vapor-phase carbon replacement cost for this system is included in capital cost.

In order to monitor the effectiveness of this treatment method, soil gas samples would be collected from the air extraction wells discharge line. When soil gas samples show the concentration to be below detection limits, soil cores would be taken for analysis.

Alternative 3 is a system that essentially transfers the VOCs from the soil to the air. That air stream will be then treated with vapor-phase carbon adsorption prior to discharge to the atmosphere.

Based on the available operating experience reported for this treatment method for VOCs, complete removal of contaminant mass from the unsaturated zone is expected to occur within a year. Because this alternative will actually remove the VOCs from the soils in a relatively short time, in evaluating its impact on ground water cleanup it is considered functionally equivalent to excavation of the soil from the contaminated area.

The reduction in ground water concentration would be similar to that for the surface cap alternative. Within 3 years, the ground water concentration would decrease to 100 ppb.

The total mass of VOCs remaining would be controlled by the mass in the ground water, since the 1700 lbs of VOCs in the unsaturated zone are expected to be removed at the start of the enhanced volatilization system. After 1-1/2 years, the total mass of VOCs remaining would be approximately 100 lbs. (2 percent of the initial total mass of 5600 lbs).

ALTERNATIVE 4:

Alternative 4 is designed to reduce the level of contamination in the unsaturated zone by washing the VOCs from the unsaturated zone soils into the ground water. Treatment would be provided by the ground water extraction system.

A number of berms would be built over the contaminated soils forming enclosed collection basins. Clean water would be pumped into each basin, and allowed to percolate through the contaminated soil. As the clean water percolates through the contaminated soil, the VOCs would be "washed" into the ground water which would be collected by the ground water extraction well system. Each bermed area would receive 100 inches of water each year.

Table 7

Cost for Alternative # 4
Soil Washing

Capital Cost	$58,000
Annual O & M	$ 6,000
Present Worth (3 years)	$69,000

It is anticipated that the ground water concentration would decline more slowly for this alternative than for others. Projections indicate that the ground water concentration would reach 100 ppb after approximately 8 years. By comparison, under the natural recharge conditions in Alternative 1, the ground water concentration would reach 100 ppb after 5 years.

The benefit of rapidly leaching the VOCs out of the unsaturated zone into the ground water is realized in the total contaminant mass removed. The total mass remaining (soils and ground water) would be less than 100 lbs. (2 percent of the initial 5600 lbs) after 8 years.

ALTERNATIVE 5:

Alternative 5 is designed to reduce the leaching of contaminants from the unsaturated zone into the ground water by excavation and disposal of the contaminated soil in an onsite disposal facility. A double-lined landfill, consistent with the 1984 RCRA Amendments, would be constructed on or near the Thomas Raymond Road property. Any leachate collected from the landfill would be treated at the existing Verona Well Field air stripper.

The volume of contaminated soil to be excavated is approximately 4,400 cubic yards. This is based on excavation of soil with a contaminant concentration of 100 ppb. (See Figure 10). The 100 ppb level was selected because 99 percent of the mass of VOCs in the unsaturated zone is within the 100 ppb contour. Soil would have to be excavated at a 2:1 slope to prevent sidewall collapse of the excavated area; and excavation would be to the depth of the water table. At the 2:1 slope, an additional 4900 cubic yards of uncontaminated soil would also have to be excavated, resulting in a total of 9300 cubic yards of soil requiring disposal in the onsite facility.

Table 8

Cost for Alternative # 5
Soil Excavation with Onsite Disposal

Capital Cost	$1,632,000
Annual O & M	$ 26,000
Present Worth	$1,677,000

After construction the onsite landfill would require closure under RCRA as a disposal facility. Ground water monitoring would be required at the site following closure.

For this alternative, the total mass of VOCs remaining is a funcition of the mass in the ground water since the VOCs in the excavated soil are isolated in the onsite landfill. The ground water concentration would decrease to 100 ppb after about 3 years. After 1.5 years the total contaminant mass remaining (entirely in ground water) would be approximately 100 lbs (2 percent of the initial total mass of 5600 lbs); however, 1700 lbs of VOCs would remain onsite in the disposal facility.

ALTERNATIVE 6:

This alternative is similar to Alternative 5, with the exception that excavated soil would be transported to an offsite disposal facility. Two potential disposal sites that are being upgraded to comply with the RCRA-Amendment requirements for double-lined containment have been identified. The two sites are Wayne Waste Disposal, Belleville, MI and Fondessy Enterprises, Oregon, OH. Wayne Waste is approximately 120 miles from Battle

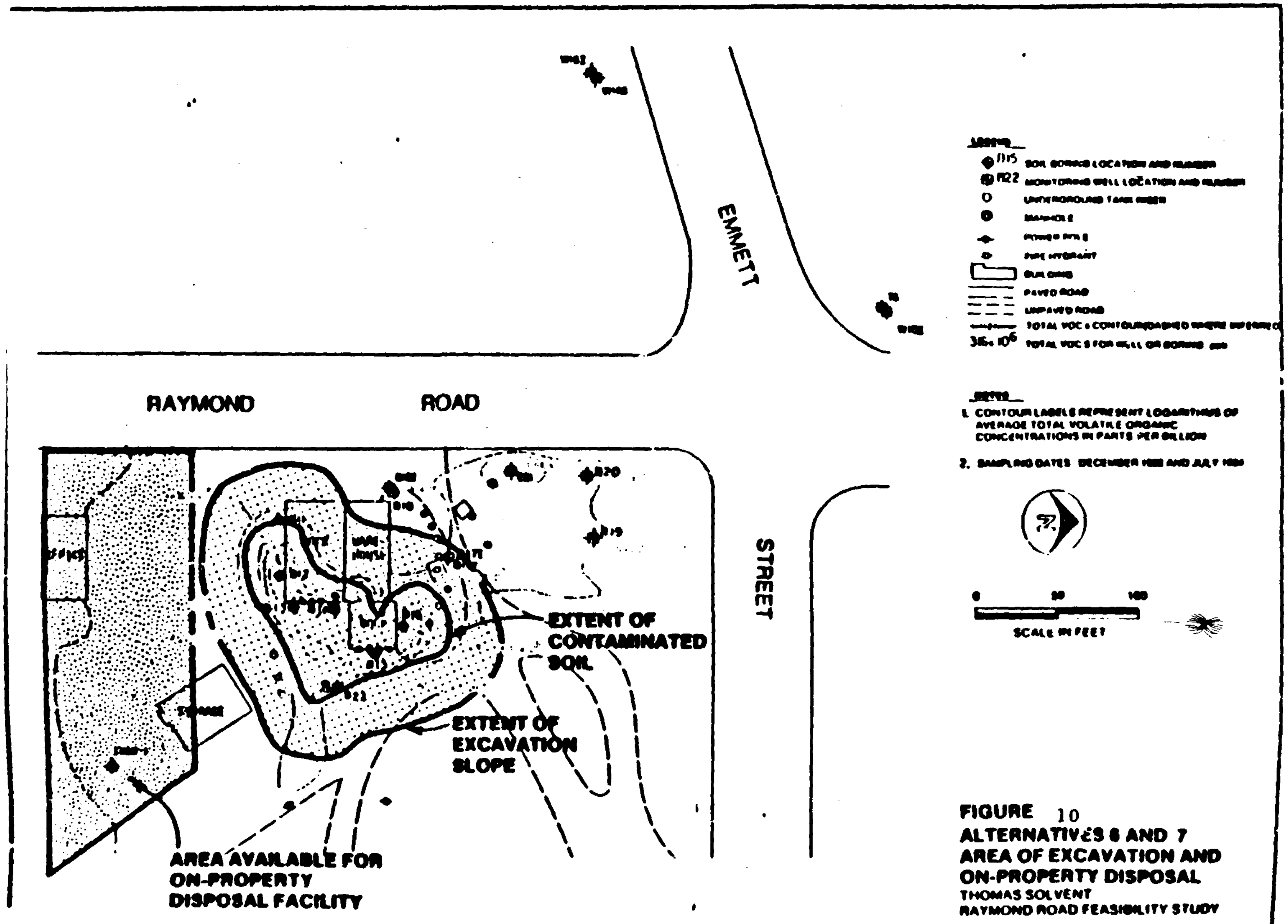


FIGURE 10
ALTERNATIVES 6 AND 7
AREA OF EXCAVATION AND ON-PROPERTY DISPOSAL
THOMAS SOLVENT
RAYMOND ROAD FEASIBILITY STUDY

Creek, and Fondessy is 180 miles away. For those haul distances, each truck could be expected to make one round trip per day. Assuming 30 cubic/yards per truck load and a total excavated volume of 9300 cubic yards of soil, approximately 300 truck loads would be necessary to transport the soils.

Table 9
Cost for Alternative # 6
Soil Excavation with Offsite Disposal

Capital Cost	$2,471,000
Annual O & M *	$ 0
Present Worth (3 years)	$2,471,000

*Operation and Maintenance Costs for offsite disposal facility are included in initial disposal charge.

Impact on the ground water cleanup would be identical to that described for Alternative 5.

Summary:

Each of the alternatives evaluated has the same ground water extraction system as described for Alternative 1. The difference between alternatives lies in the approach to the contaminated soils in the unsaturated zone. Each of the soil alternatives would move the contaminants out of the unsaturated zone at different rates. The rate at which contaminants leach into the groundwater has an effect on the rate of ground water clean up.

The effectiveness of each alternative can be evaluated based on the total mass of VOCs remaining in the unsaturated soil zone and the ground water. The total VOC mass remaining in the system with time for each alternative is plotted in Figure 11. Alternatives 3, 5 and 6 will remove the mass of contaminants from the site more quickly than the other alternatives. Alternative 4 is the next most effective. Alternative 1 would initially reduce the total mass of VOCs at the same rate as Alternative 4, because the removal rate is controlled initially by the large mass of VOCs in the ground water. Eventually, removal by Alternative 1 worsens, as the removal rate begins to be controlled by the contaminant mass remaining in the unsaturated zone soils.

Alternatives 1, 3 and 4 are the only alternatives that result in actual treatment of the VOCs in the unsaturated zone. The VOCs are captured on vapor-phase carbon, and subsequently are incinerated during the activated carbon regeneration process. Alternatives 2, 5 and 6 are intended to safely secure and isolate the VOC contamination, but provide no real treatment. Alternative 2 isolates the contaminated soil in place. Alternatives 5 and 6 remove and secure the contaminated soil; one on the site property, and the other at another location.

FIGURE 11

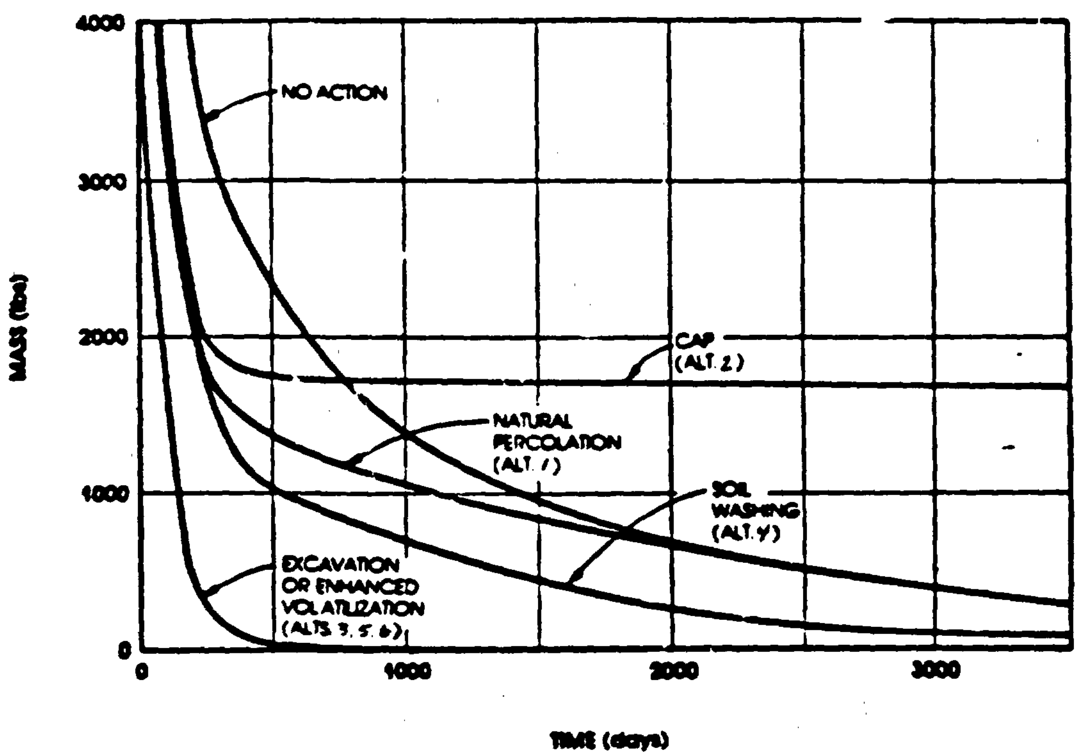


FIGURE 11
Total Contaminant Mass Remai
Summary of Alternatives
Thomas Solvents
Raymond Road Feasibility Study

Alternatives 2 and 5 would he the most complex alternatives to install. Construction of the onsite landfill would be difficult because of the limited area of the property. Installation of Alternative 2 would be difficult due to the narrow range of clay moisture content required to contruct an effective cap.

Alternatives 3, 5 and 6 will result in air emissions of the VOCs. Volatile contaminants in Alternative 3 would be controlled as a single point source emission, which would facilitate treatment. Alternatives 5 and 6 would result in the uncontrolled release of VOC emissions during excavation.

Alternatives 1, 2, 5 and 6 are demonstrated technologies. Ground water pumping and treatment have been used successfully in hazardous waste applications. Conditions at the site are suitable for the use of ground water pumping. Long-term experience with synthetic membrane, double-lined landfills in hazardous waste applications is limited. However, this design is considered to be state of the art and with proper cap maintenance, leachate production is not expected. Long-term experience with surface caps in hazardous waste applications is limited.

Alternatives 3 and 4 respresent innovative technologies. The enhanced volatilization process has been used in some hazardous waste applications, but long term experience in a variety of applications is limited.

Summary of Costs

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Capital Cost, $	1,248,000	291,000	413,000	58,000	1,632,000	2,471,000
Annual O & M, $	90,000	19,000	0	6,000	26,000	0
Present Worth, $ (3 years)	1,400,000	324,000	413,000	69,000	1,677,000	2,471,000

Community Relations

Copies of the Phased Feasibility Study (PFS) were made available to the community on June 17, 1985. Two locations served as repositories within the community: Battle Creek City Hall and Willard Library. EPA placed an advertisement in the community's daily newspaper advising the public of the start of the three week public comment period and schedule for a public meeting.

The public meeting was held July 2, 1985 at the Battle Creek City Hall. Approximately 30 residents attended the meeting. Representatives of the EPA, State and local governments were present. The EPA made a presentation that described the alternatives that had been evaluated in the PFS. In addition, EPA responded to general questions regarding the project.

The only alternative that received an endorsement at the meeting was Alternative 3, which was supported by the City. Several residents did not think that three weeks was an adequate period of time in which to review the PFS. EPA agreed to extend the comment period an additional two weeks. The responsiveness summary is attached to this summary.

Consistency With Other Environmental Laws

The NCP [40 CFR 300.68] establishes the process for determining appropriate remedial actions at Superfund sites. As a general rule, EPA will pursue remedies that meet the standards of applicable or relevant Federal public health or environmental laws.

Other environmental laws which may be applicable or relevant to the remedial alternatives evaluated in the PFS are the Resource Conservation and Recovery Act (RCRA) and the Clean Water Act. Since source control at the Thomas Raymond Road facility is the first operable unit at the Verona Well Field site, and does not constitute the final remedy, the RCRA 40 CFR Part 264 regulations for closure and ground water protection do not apply. Final closure of the Thomas Raymond Road site, and the level of ground water cleanup to be attained by the proposed ground water extraction system will be evaluated in the final remedy operable unit.

However, the alternatives that include excavation of contaminated soils (Alternatives 5 & 6) constitute management of hazardous waste and consequently the technical standards for onsite and offsite landfill design have been applied.

All of the remedial alternatives considered include the extraction of contaminated ground water from the Thomas Raymond Road site, treatment at the existing Verona air stripper, and discharge to the Battle Creek River. The Clean Water Act provisions for regulating the discharge of wastewaters are administered by the State through the National Pollutant Discharge Elimination System (NPDES) program. Under that program, the State establishes effluent discharge limits based on two different criteria: 1) ambient water quality, and 2) technology. Water quality based effluent limits are derived for each contaminant by reviewing acute and chronic toxicity data and then calculating allowable levels in the receiving stream. In addition, for toxic pollutants, the best available technology economically achievable (BAT) must be used. For the treatment of VOC-contaminated water air stripping is considered as BAT.

The MDNR Toxic Chemical Evaluation Section has evaluated the expected discharge from the Verona air stripper and has proposed water quality based effluent limits. The expected initial discharge from the air stripper would exceed these proposed water quality based effluent limits. Therefore, during the initial 4-week operating period, a temporary carbon adsorption system will be used to pre-treat the 400 gpm flow from the Thomas Raymond Road ground water extraction system. In this way, the technical requirements of the Clean Water Act for wastewater discharges will be met, since the discharge will be treated with BAT, and meet water quality based effluent limits.

The present operation of the Verona air stripper results in an air emission of VOCs. To control these emissions, a vapor-phase carbon adsorption system was installed as part of the IRM. Region V's Air Management Division has modeled the emissions from the vapor-phase carbon adsorption system for the present operating conditions, and also after treatment of ground water from the Thomas Raymond Road facility is begun. The excess cancer risk presented by the existing air stripper operation is 1.1×10^{-7}. After treatment at the air stripper of ground water pumped from the Thomas Raymond Road facility is started the risk will be 3.7×10^{-7}. The risk levels are considered acceptable, and do not represent a substantial threat to public health.

Recommended Alternative

It is the recommendation of this document, based on the evaluation of the cost and effectiveness of each proposed alternative, the comments received from the public and the MDNR, and State and Federal environmental requirements, that Alternative 3, enhanced volatilization be selected as the cost-effective alternative.

The NCP proposed rule [40 CFR 300.68(i)(1)] states that the appropriate extent of remedy should be determined by the lead agency's selection of a cost-effective remedial alternative which effectively mitigates and minimizes threats to and provides adequate protection of public health, welfare and the environment. The NCP further directs that in selecting the appropriate extent of remedy, the lead agency should consider cost, technology, reliability, administrative and other concerns, and their relevant effects on public health, welfare and the environment [300.68(i)(2)].

An operable unit, in addition to meeting the requirements of cost-effectiveness, must also be consistent with a final permanent remedy [300.68(d)(3)].

Table 10 provides summary information comparing the alternatives for these criteria to permit the selection of a "cost-effective alternative" as defined in the NCP.

Although Alternative 3 is not the lowest cost alternative, it provides an increased measure of environmental protection. Alternative 3, along with Alternatives 1 and 4 are the only proposed alternatives that actually remove and treat the contamination from the unsaturated zone; VOCs captured on liquid and vapor-phase activated carbon are thermally destroyed during the regeneration process.

Implementation of Alternative 3 does not require the physical removal of the contaminated soil. Consequently, exposure of the public to uncontrolled VOC emissions in an urban setting, that would occur during implementation of Alternatives 5 and 6 is not a factor.

Alternative 3 does transfer the VOCs from the soil in a concentrated form to different media (i.e., air and water); however, these concentrated waste streams will be controlled as point source emissions, which can be adequately treated prior to discharge to the atmosphere and surface water.

Alternative 3 contains the following groundwater extraction system:

- Installation of nine groundwater extraction wells in the vicinity of the Thomas Raymond Road facility. The total groundwater pumping rate would be 400 gpm.
- Installation of an 8-inch diameter transfer pipe with an in-line booster pump from the extraction wells at Raymond Road to the air stripper at the Verona Well Field (approximately one mile).

Table 10
SUMMARY OF ALTERNATIVES ANALYSIS

Alternative	Cost ($1,000)* Capital	Cost ($1,000)* 3-yr PW[a]	Technical Concerns	Environmental and Public Health Concerns	Institutional Issues	Consistency With Final Remedy
1 Groundwater Pumping Only	$1,240	$1,404	Demonstrated technology	Small increase in discharges to air and surface water. Continued fugitive emissions from site	Subject to surface water and air discharge standards	Would contribute to final remedy
2 Capping With Groundwater Pumping	1,539	1,728	Demonstrated technology. Difficult construction. Requires long-term O&M	Isolates unsaturated zone contamination from groundwater. Does not cleanup unsaturated zone. Pumping system protects groundwater	See Alternative 1	Might conflict final remedy
3 Enhanced Volatilization With Groundwater Pumping	1,817	2,020	Innovative technology. Good likelihood of success	Removes contamination from unsaturated zone. Pumping system protects groundwater	See Alternative 1	Would contribute to final remedy
4 Soil Washing With Groundwater Pumping	1,306	1,473	Innovative technology. Good likelihood of success	Removes contamination from unsaturated zone. Pumping system protects groundwater	See Alternative 1	Would contribute to final remedy
5 Excavation to Onsite Landfill With Groundwater Pumping	2,880	3,081	Demonstrated technology	Air emissions during excavation. Contaminants are isolated from groundwater, but not removed from site. Pumping system protects groundwater	See Alternative 1. Also, landfill subject to RCRA requirements	Might conflict with final remedy
6 Excavation to Offsite Disposal With Groundwater Pumping	3,719	3,875	Demonstrated technology	Air emissions during excavation. Contaminants are removed from site	See Alternative 1. Also, operations subject to RCRA waste generator requirements	Would contribute to final remedy

[a] 3-year present worth cost.

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* The capital and present worth costs shown for each alternative include the costs for the groundwater pumping system of Alternative 1.

* During the first 4 weeks of operation, an activated carbon system would be used to pretreat the 400 gpm of initially high concentration water from Raymond Road, before treatment in the air stripper.

The elements of unsaturated zone soil treatment follow:

* Installation of eight air extraction wells across the contaminated soil zone.

* Installation of a vacuum pump and header piping to evacuate the wells. The vacuum pump would discharge to a vapor phase carbon system prior to discharge to the atmosphere.

The recommended action is considered a source control measure as defined in Section 300.68(e) of the NCP. The objective of the action is to treat the contaminants in the soil on the Thomas Raymond Road property, and minimize continued migration of the highly contaminated ground water surrounding the site.

The capital cost estimate for Alternative 3 is $1,660,000. The annual operation and maintenance costs for the first two years of operation would be $90,000. After year two, the annual O & M costs would decrease to $46,000. The length of time that this system will operate will be determined by the final remedy.

Operation and Maintenance

The operation and maintenance activities required for Alternative 3 are as follows:

Routine inspection of and readings from the air extraction vacuum pump and the vapor-phase carbon adsorption system would be necessary. The air delivered from the air extraction wells to the carbon adsorption system would be monitored weekly for the first 3 months. Thereafter, monitoring of the air would be monthly.

The effectiveness of the system would be determined by monthly monitoring of a permanent soil gas sampling system.

• Facility inspection	$ 6,000
• Sampling and analysis	18,000
• Maintenance	6,000
• Electric power	5,000
• Vapor phase carbon replacement	30,000
• Organics disposal	4,000
Subtotal	$69,000
30% Contingency	21,000
Total	$90,000

The above costs include the O & M activities that would be required for the ground water extraction system.

The groundwater extraction wells and also the monitoring wells would require sampling. The proposed sampling schedule is shown below:

Sampling Schedule

Period	Frequency	# Samples
Pre-Operation	Twice	36
Start-up - 2 Weeks	Every 2 days	126
2 Weeks - 2 Months	Weekly	108
2 Months - 1st Year	Monthly	162
Year 1 - Completion	Quarterly	72

Changes in this schedule might be made based on the results of the monitoring. In addition to the water quality sampling, water levels will be measured on the same frequency at all the wells in the site vicinity.

Superfund response activities can be divided into two phases for the purposes of determining Fund eligibility: remedial action and post-closure. Only costs incurred during the remedial action phase are eligible for funding under Superfund. The remedial action phase may include activities that normally are considered operation and maintenance costs, for instance, in cases where construction itself will not result in achieving cleanup goals. In general, the following criteria have been used to distinguish remedial actions from post-closure activities:

- Remedial actions include measures that control contamination at or near the source of release,
- Have a definable endpoint based on contaminant levels, and are of limited duration (usually less than 5 years).

Cleanup with Enhanced Volatilization is expected to be complete within 3 years after the initial contruction is completed. Therefore, based on the criteria above the capital costs and O & M costs can be considered a necessary part of the remedial action and are eligible for the Fund.

Schedule

Approve Remedial Action (sign ROD)	08/09/85
Award Superfund State Contract for Construction	09/16/85
Complete Design	09/30/85
Start Construction	10/14/85
Complete Construction	01/14/86

Future Actions

The remedial investigations at the Thomas Solvent Raymond Road and Annex facilities have been completed. A work plan for additional remedial investigation activities at the GTRR marshaling yard has been prepared. Discussions with GTRR will be initiated to determine their willingness to perform the investigations.

Additional feasibility studies will be completed in a series of operable units. The next operable unit will address source control at the Thomas Solvent Annex and the GTRR marshaling yard. After that operable unit is implemented, the final remedy for the well field itself will be evaluated.

Community Relations Responsiveness Summary
Verona Well Field
Thomas Solvent Raymond Road
Operable Unit

Introduction

This "Community Relations Responsiveness Summary" documents citizens concerns and issues raised during the public comment period on the phased feasibility study (PFS) for source control remedial action at the Thomas Solvent Company's (Thomas) Raymond Road facility.

Concerns Raised During the Comment Period

The PFS was completed on June 17, 1984. Copies of the PFS were made available to the community on the same day. A public meeting was held at the Battle Creek City Hall on July 2, 1984 to present the PFS and solicit public comment. The public comment period was originally scheduled to close July 8, 1984, but in response to public comment the deadline was extended to July 20, 1985.

Approximately 30 residents attended the public meeting. After the Agency's presentation, 6 attendees asked questions and provided comments regarding the proposed alternatives. The Agency subsequently received 10 written statements regarding the proposed remedial action alternatives. Written comments include letters from a public interest group, and several area residents. The following discussions address the most prevalent concerns expressed by the commentators. Where similar comments have been received on the same topic, the comments have been summarized and paraphrased to identify the specific issue. The intent has been to present the full range of topics and details of the overall comments without lengthy repetition.

Questions and comments offered during the comment period were in two main categories:

- General comments
- Comments relating to specific technical issues.

GENERAL COMMENTS

Issue: Length of Public Comment Period

Many of the area residents have stated that a 3-week public comment is an inadequate time in which to review the phased feasibility study.

1. Comment: The feasibility report is being presented for public comment with far too short a period for review. An extension of the deadline to July 20, 1985 is requested.

2. Response: There appeared to have been some confusion on the part of several residents, as to when the public comment had officially started. A number of residents, in their written comments indicated that the time period of July 2 - July 8, 1985 was insufficient. That particular time period referenced, marks the length of time from the date of the public meeting to the end of the comment period. In fact, however, the official comment period had started two weeks earlier on June 17, 1985.

A public notice, announcing the start of the comment period on June 17, 1985, and also, the locations where reports would be available for review, appeared as an advertisement in the Battle Creek Enquirer on June 5, 1985. Also at an informal small group meeting held with area residents on the night of June 13, 1985, the remedial project manager indicated to those in attendance that the phased feasibility study would be available for their review on June 17, 1985.

However, at the request of a resident at the public meeting, U.S. EPA extended the comment period (from July 8 to July 20) to allow the public more time to review the phased feasibility study.

Region V EPA follows a procedure for community relations and public involvement that is set forth in federal Superfund guidance. The National Oil and Hazardous Substance Contingency Plan (NCP), which contains the regulations for implementing the Superfund law, says- "... response personnel should to the extent practicable,... be sensitive to local community concerns (in accordance with applicable guidance)." [Subpart F 300.61] The guidance is contained in "Community Relations in Superfund: A Handbook."

According to the guidance, a minimum 3-week public comment period on the feasibility study must precede the selection of an alternative. This guidance applies to all Superfund sites, and was not applied arbitrarily to the Verona Well Field site.

Issue: Evacuation Plan

A number of area residents have asked about plans for the safety of residents during the clean-up.

Comment: Has EPA prepared an evacuation plan for relocation of area resident during the remedial action?

Response: The need for an evacuation plan will be addressed during preparation of the construction site health and safety plan. Implementation of the Enhanced Volatization alternative does not require the physical removal of the contaminated soil. Construction will be limited to the installation of ground water and air extraction wells. The necessary connection piping will be installed below ground. As a result of remedial action VOCs from the soil will be transferred from the contaminated soil to different media (i.e., air and water); however, these waste streams will be controlled as point source emissions, which can be adequately treated prior to discharge to the atmosphere and surface water.

COMMENTS ON SPECIFIC TECHNICAL ISSUES

Issue: Treatment of Excavated Soils

The comment was made that the phased feasibility study did not adequately evaluate technologies for treating (decontaminating) excavated soils prior to disposal in a landfill.

Comment: Excavation for treatment should not have been eliminated from consideration in the phased feasibility study.

Response: Technologies for treating excavated soils were considered in the phased feasibility study during technology screening. The technologies available for treatment of excavated soils are similar to those for treatment of soils in-place. In addition, excavated soils can be thermally treated by incineration.

Generally speaking, the advantages of excavating soils prior to treatment over in-place treatment are that; 1) treatment takes place in process equipment, where the environment can be better controlled, 2) better mixing of contaminants and reactive agents can be achieved, and 3) treatment can be more easily verified. The PFS considered soil washing, drying, chemical degradation, biological degradation and incineration.

At many sites, there may be some treatment effectiveness benefits to washing soils after excavation as opposed to in-place treatment due to better control of the treatment process. However, for the homogenous soils at the Thomas Solvent's Raymond Road facility, in-place treatment will result in a similar degree of contaminant removal as treatment after excavation. Chemical and biological degradation were eliminated from further consideration, because the breakdown products of the chlorinated hydrocarbons are themselves toxic compounds.

Comment: A properly run incinerator is not subject to the criticisms leveled against chemical and biological degradation, namely failure to effectively remove contaminants and dangerous after-products.

Response: Incineration will destroy organic contaminants like those present in the soils at the Raymond Road site. However, there is limited off-site incinerator capacity nationwide, for the treatment of contaminated soils. Considering off-site incinerator capacities, and scheduling coordination with other users of the incinerator facilities, off-site incineration of the excavated soil could be expected to take years to complete.

Another consideration is the amount of auxiliary fuel required to incinerate soil. Wastes with a heating value of 4,000 to 5,000 Btu/lb generally do not require additional fuel to sustain combustion. Since the soils at the site are primarily sands and gravels, they would provide little combustible material for fueling incineration. The cost of fuel oil necessary to heat up the soils and maintain desired incineration temperatures would make this alternative prohibitively expensive.

Comment: The PFS gives implicit approval for incineration, since it is the recycling method used for granular activated carbon.

Response: Incineration of excavation soils varies from the thermal degradation process used to regenerate activated carbon; the goal, removal of volatile contaminants is achieved via both methods. The process of regenerating activated carbon drives off the adsorbed contaminants which are then treated in an after burner and reactivates the carbon for reuse. This system concentrates and consolidates the contaminants for efficient, timely and cost-effective destruction, with no end product for disposal.

Soil incineration with the same destruction removal efficiency requires extremely high temperatures for substantial soil volume, resulting in much greater energy expenditures and generates waste material which requires controlled disposal.

Comment: A description of the organic phase liquid observed at the site would be appropriate.

Response: The separate organic phase liquid was first discovered on February 10, 1984 during sampling by U.S. EPA of monitoring well B-18. The major chemical constituents of this organic phase liquid are as follows:

acetone	2.6	grams/liter
2-butanone	0.5	"
1,2-dichloroethane	1.1	"
1,1,1 trichloroethane	30.7	"
trichloroethylene	44.3	"
tetrachloroethylene	56.2	grams/liter
carbon tetrachloride	0.9	grams/liter
benzene	1.2	"
toluene	48.2	"
ethyl benzene	7.8	"
O-xylene	13.3	"

The organic phase liquid is limited in extent to the area in the vicinity of monitoring well B-18. Based on the results of vertical sampling in the area, it appears that the organic phase liquid originates from a high concentration suspension of the solvents in the capillary fringe between the unsaturated and saturated zones.

Comment: If VOCs are dangerous in the water, why should they be less dangerous in the air?

Response: The contaminated groundwater from the Thomas Raymond Road facility will be pumped from the site to the exiting Verona air stripper for treatment. The objective of ground water treatment by air stripping is to transfer the VOCs from the contaminated groundwater into an air stream. The exiting air stream emissions from the air stripper will be controlled by a vapor-phase carbon adsorption system.

The Air Management Division, Region V, EPA has modelled the expected air emissions from the Verona air stripper after ground water pumping from Raymond Road begins, and calculated the excess cancer risk attributable to these emissions. The analysis has assumed that 90 percent removal of VOCs can be achieved with vapor-phased carbon adsorption.

In order to establish baseline conditions, the risk from inhalation due to the current operation of the Verona air stripper was determined. Based on the expected emission rate from the air stripper for different periods during the operation of the Thomas Raymond Road pumping system, the air dispersion model calculated the peak VOC concentration and also the location downwind where the peak concentration will occur. The peak risk from the ongoing air stripping is 1.1×10^{-7} (approximately 1 in 10,000,000) at a point 160 to 180 meters last of the air stripper. This means that a person breathing the air at the peak concentration location, for a 70 year lifetime would have a 1 in 10,000,000 additional risk of contracting cancer.

The introduction of groundwater from the Thomas Raymond Road site for treatment at the air stripper represents an additional risk that must be accounted for.

The concentration of the ground water delivered from the Raymond Road pumping system can be characterized for three distinct operating periods: 1) first day's operation, 2) first month's, and 3) after the first month. The additive peak cancer risks from inhalation of emissions from the air stripper during these operating periods were calculated. The estimated peak risk is 2.7×10^{-7} during the first day, 3.1×10^{-8} for the first month and 2.6×10^{-7} after the first month until completion of the project.

These calculated health risks are extremely conservative in that, they assume the ground water concentration for the applicable day or days would exist for 70 years. The cumulative "average" lifetime cancer risk has been estimated to be 3.7×10^{-7}. As a guideline for risk management related to Superfund actions, U.S. EPA has determined that excess cancer risks resulting from proposed cleanups should not exceed a 1×10^{-6} (1 in 1,000,000) risk. The 3.7×10^{-7} risk presented by air emissions from the Verona air stripper during the Thomas Raymond Road cleanup are considered acceptable, and do not represent a substantial threat to public health.

Comment: Landfills have been demonstrated not to work.

Response: Transferring waste from one site to another is also a concern of the U.S. EPA. The most recent policy on offsite landfills is meant to assure that future problems will not arise at such landfills. New landfill cells must be specially constructed with a double liner and double leachate collection system. Offsite disposal facilities must be checked for compliance with current U.S. EPA regulations before any Superfund waste can be disposed of at the facility.

Comparison of the performance of existing landfills to new double-lined RCRA-permitted facilities is not valid. Until recently, existing facilities have been accepting high concentrations of liquid wastes. The 1984 Amendments to RCRA have banned landfilling of liquid hazardous wastes. Leachate generated at a facility containing these types of liquid wastes may contain elevated concentrations of contaminants. Double-lined cells are the state-of-the-art in landfill design and, with proper cap maintenance, leachate production is not expected.

Comment: What data already exist concerning the effectiveness of "enhanced" volatilization?

Response: The enhanced volatilization process has been used successfully in a number of hazardous waste applications; however, long-term experience in a variety of situations is limited. U.S. EPA recognizes that this process is appropriately classified as innovative technology. However, this process has been successfully used to recover VOCs from soils contaminated by leaking underground storage tanks. Terra Vac, Inc., one of the firms developing this new technology has reported the recovery of carbon tetrachloride, methylene chloride, hexane, acetone, methanol and gasoline in applications in a variety of hydrogeological settings.

It is important to recognize that the cleanup of the Thomas Raymond Road facility will not rely on the use of enhanced volatilization as a stand-alone technology. The ground water pump and treat system will capture and treat the contaminated ground water in the vicinity of the Raymond Road site. If no further response action were taken beyond ground water pumping and treatment, the mass of VOCs in the unsaturated zone soils would eventually be removed as a result of the natural recharge resulting from normal rainfall. The contaminants would be leached into the ground water, where they would be contained by the ground water extraction system and treated at the Verona air stripper. However, remedial action for VOC contamination of ground water is a long-term operation. When a considerable amount of contamination remains in the unsaturated zone, continued contaminant transport to the ground water by percolation will extend the time for cleanup to be achieved. U.S. EPA is recommending the use of enhanced volatilization in conjunction with ground water pumping in an effort to shorten the time for cleanup.

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